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Book Review: *Cognition and Chance: The Psychology of Probabilistic Reasoning*

Raymond S. Nickerson, Mahway, NJ: Lawrence Erlbaum Associates, 2004. xi + 520 pp., \$49.95

At 520 pages, with a title of *Cognition and Chance: The Psychology of Probabilistic Reasoning*, I hoped this book would deepen my understanding of how human beings reason probabilistically. My interest stems from teaching and practicing statistics where I have learned to be wary of quantitative intuition. I think this is a common feeling among statisticians who, as a group, often directly experience the inherent limitations and biases of how human beings observe, process, and interpret quantitative information. We know, for example, that human beings: tend to find patterns in data where none exist; are wonderfully adept at *post hoc* rationalization of results and outcomes; quickly leap from correlation to causation; are subject to many subtle biases; etcetera.

So, an authoritative treatment of the psychology of probabilistic reasoning would be quite useful and could help us understand when to trust and when to question human intuition. For example, what types of quantitative reasoning is the human brain naturally better or worse at? When are we good intuitive probabilists and when are we bad? Do we know why? Thus, in reading this book I hoped to gain a better understanding of such issues, if for no other reason than to help me better know when to trust my own intuition. Unfortunately, this book did not live up to my expectations. As I will discuss more fully below, it disappointed in three specific ways.

The first disappointment is that the amount of the text specifically devoted to probabilistic reasoning is relatively small compared to the book's length. At 520 pages and 12 chapters, I expected a fairly deep and thorough discussion of the book's titled topic. Yet only chapter 11 ("People as Intuitive Probabilists") is devoted to the particular subject of probabilistic reasoning. Chapters 8 through 10 ("Estimation and Prediction," "Perception of Covariation and Contingency," and "Choice under Uncertainty") are also related, discussing other aspects of quantitative reasoning, but fully two-thirds of the book is devoted to topics that are largely general background material.

In particular, chapters 1 through 7 focus on topics such as: a general history of the field of probability as it developed from games of chance; the various meanings, interpretations, and misinterpretations of the concepts of randomness and coincidence; an entire chapter explaining Bayes' Theorem; another chapter devoted to a discussion of various paradoxes (St. Petersburg, Simpson's, etc.); and, a general exposition of the field of statistics. These chapters seem to have been written for a lay-audience and are largely non-quantitative. Other than perhaps the first chapter, they are likely to be only of passing interest to someone with advanced statistical training.

The second disappointment is the exposition tends to be more broad than deep. A typical discussion in the later chapters is of the form "researcher A found this and researcher B found that, while researcher C found a contrary result" with the results only described in the briefest and most general terms. Few, if any, specifics about the various research efforts are described and little effort seems to have been made to discuss the results in anything more than a superficial manner. For example, in Chapter 8 the author wrote, "When asked to observe a set of numbers and to estimate some measure of central tendency, such as its mean, people are able under some conditions to produce reasonably accurate estimates (Beach & Swensson, 1966; Edwards, 1967; C.R. Peterson & Beach, 1967), although systematic deviations from actual values have also been reported (N.H. Anderson, 1964; I.P. Levin, 1974, 1975)" (p. 284). Now, while I have chosen one of the more egregious examples of a singularly unhelpful "discussion," the lack of detail is not atypical of the book's general tone and approach. As a result, the reader is often left without enough information to truly understand the strengths or limitations of the cited results or the author's summary conclusion.

In a related vein, while the author's grasp of a very large body of material is quite impressive, the narration often feels more like a wandering discussion than a focused examination. Further, while each chapter does have a summary section, as does the book, each of these is superficial, simply regurgitating various general discussions from each chapter in an even more general fashion. In fact, after 435 pages of text, the summary chapter for the entire book is *less than two full pages long*.

The third disappointment – related to the second – is the failure of the text to go beyond lists and discussions of individual studies and provide the reader with a broader context in which to place the information. That is, upon completion of the book the reader is left with various categories of research study results generally summarized, but little to no information about what this means for the broader question of how humans reason quantitatively and whether or not there are theories or models that help explain, summarize, or synthesize the various study results into some larger framework of human probabilistic reasoning.

For example, there are no charts or graphics or tabularizations anywhere in the book that provide the reader with an overview or taxonomy of the field of research. Similarly, there is no outline or description of how psychologists think about or summarize the observed phenomenon nor any real discussion about various theories that may exist to explain human quantitative or probabilistic reasoning. Nothing in the book provides a reader with any sort of “big picture” within which to understand how the various lengthy expositions fit.

Criticism aside, in reading *Cognition and Chance: The Psychology of Probabilistic Reasoning*, I did expand my knowledge about probabilistic reasoning. My disappointment may be the result of unrealistic expectations on my part or perhaps insufficient editorial assistance by the publisher. On the positive side, the book does bring together many diverse sources and results on a host of topics. As such, it could serve as a useful starting point for the new researcher beginning a study of some aspect of quantitative reasoning.

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